

ABSTRACT

An MRI guided surgical apparatus includes a heat source formed by a laser and an optical fiber carrying the heat energy into a part to be coagulated by hyperthermia with an end reflector to direct the energy in a beam to one side of the fiber end. A reinforcing sleeve for the fiber is mounted in a shielded, Piezo-electric motor which causes movement of the fiber longitudinally and angularly within a rigid elongate cannula. A magnetic resonance imaging system is arranged to generate a series of output signals over a period of time representative of temperature in the part as the temperature of the part changes during that time. The heat source is controlled in heat energy applied and location and orientation of the beam to stop heating when the temperature at the boundary of a tumor reaches the required hyperthermic temperature. Cooling of the tip portion of the probe is effected by expansion of a supplied cooling fluid in gaseous form through a restrictive orifice into an expansion zone at the probe end. The fiber is thus encased in a stiff tubular titanium probe with a relatively small fluid supply duct along the inside of the probe with the interior of the probe acting as a return duct for the expanded gas. Thus the fiber end is contained in gas rather than liquid and the temperature of the probe end can be monitored by a sensor in the probe end and controlled by controlling the pressure in the supplied cooling fluid. The probe is driven in the longitudinal and rotational directions to move the fiber tip.